FIELD PLANTING PLAN FOR 10 ACRE
FIELD OF SANSEVIERIA AT BOYNTON FLA.
1943

Photographs Sansevieria, 1943 Report 2 volumes

~~Joiner~~ Joyner

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SANSEVIERIA INVESTIGATIONS IN FLORIDA
1943

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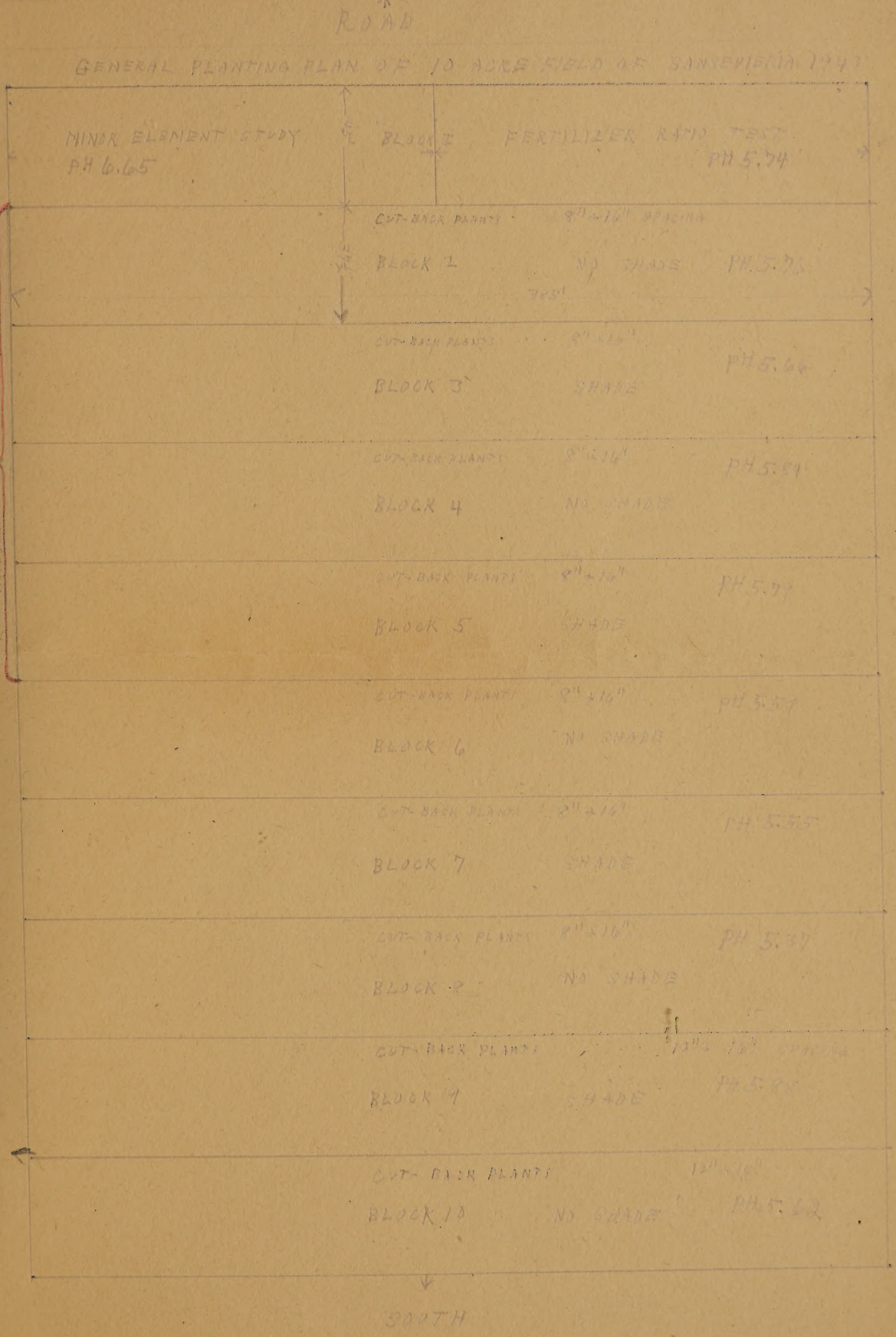

ROAD
GENERAL PLANTING PLAN OF 10 ACRE FIELD OF SANSEVIERIA
MINOR ELEMENT STUDY
PH 6.65
BLOCK 1
FERTILIZER RATIO TEST
PH 5.74
CUT-BACK PLANTS
8"-16" SPACING
BLOCK 2
NO SHADE
PH 5.75
CUT-BACK PLANTS
8"-16"
PH 5.66
BLOCK 3
SHADE
CUT-BACK PLANTS
8"-16"
PH 5.84
BLOCK 4
NO SHADE
CUT-BACK PLANTS
8"-16"
PH 5.71
BLOCK 5
SHADE
FERT. RATE, RATIO, SPACING AND SHADE STUDY
CUT-BACK PLANTS
8"-16"
PH 5.57
BLOCK 6
NO SHADE
CUT-BACK PLANTS
8"-16"
PH 5.55
BLOCK 7
SHADE
CUT-BACK PLANTS
8"-16"
PH 5.37
BLOCK 8
NO SHADE
CUT-BACK PLANTS
12"-16"
PH 5.7
BLOCK 9
SHADE
CUT-BACK PLANTS
12"-16"
PH 5.62
BLOCK 10
NO SHADE
SOUTH

CUT-BACK PLANTS 12"x 16"

BLOCK 11 SHADE PH 6.32

CUT-BACK PLANTS 12" x 16"

BLOCK 12 NO SHADE PH 6.54

CUT-BACK PLANTS 12" x 16"

BLOCK 13 SHADE PH 6.25

CUT-BACK PLANTS 12" x 16"

BLOCK 14 NO SHADE PH 6.18

CUT-BACK PLANTS 12"-18" SPACING

BLOCK 15 SHADE PH 6.30

CUT-BACK PLANTS 12" x 16"

BLOCK 16 NO SHADE PH 6.27

CUT-BACK PLANTS 12"x 18"

BLOCK 17 SHADE PH 6.35

RHIZOMES 3"x 6"

BLOCK 18 NO SHADE PH 6.12

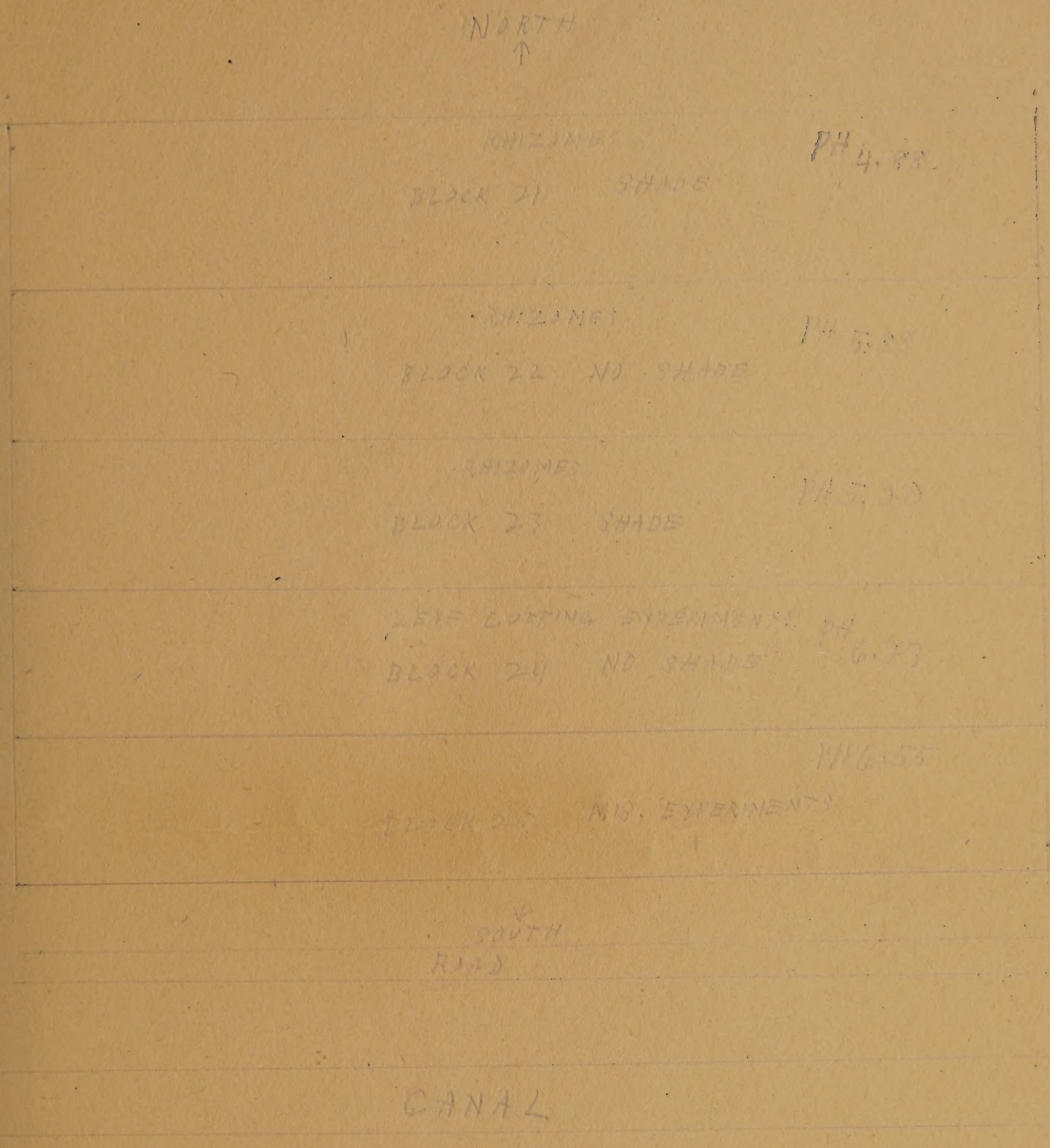
RHIZOMES 3"x 6" PH 6.38

BLOCK 19 SHADE

RHIZOMES PH 6.52

BLOCK 20 NO SHADE

SOUTH


NORTH
RHIZINES
BLOCK 21 SHADE
PH 4.65
RHIZINES
BLOCK 22 NO SHADE
PH 5.05
RHIZINES
BLOCK 23 SHADE
PH 5.30
LEAF CUTTING EXPERIMENTS
BLOCK 24 NO SHADE
PH 6.45
PH 6.55
BLOCK 25 MIS. EXPERIMENTS
SOUTH
ROAD
CANAL

SANSEVIERIA INVESTIGATIONS IN FLORIDA
1943

The principal object of the Sansevieria experiments started in February 1943 is to test the possibility of producing Sansevieria on a commercial scale for use in making fiber for high grade rope and cordage products needed in the war effort. Since Sansevieria has not been grown on a commercial scale for fiber in Florida several agronomic problems are being investigated to determine the most suitable method of growing it and the best variety to use. These problems include the effect of minor elements in promoting growth, fertilizer ratio tests, spacings in the row, width of row, effects of shade, methods of propagation, effects of mulch and effects of seasonal conditions on time of planting. Problems of decortication are being studied separately and are not discussed in this report.

Preparation and Kind of Soil

The main commercial planting of Sansevieria consists of a ten acre field located on level pineland on the farm of Oscar R. Winchester five miles West of Boynton, Florida in Palm Beach County. The soil is a Leon Fine Sand, typical of the flat woods area of Palm Beach County. The sand is loose and blows badly in dry weather when being worked. The entire flat woods area is very low and is served by a net-work of drainage canals between the Everglades and the ocean. The canals are also used for irrigation. Previous to planting Sansevieria, the field used was planted in pineapples in 1937 which were harvested in 1939. From 1939 to 1943 the field lay fallow.

To prepare the field for planting Sansevieria, the old pineapple beds were torn down and leveled. The ground was then thoroughly disked, harrowed and leveled. Lime was added at the rate of 1 1/2 tons per acre and disked into the soil a few days previous to planting. Following these operations the field was divided into 25 beds, each bed being 37 feet wide except the first bed which is 45 feet wide. The beds are 385 feet long. Beds were made by digging ditches 8 feet wide and 12 inches deep. These ditches provide drainage during the rainy season and are used for irrigation during the dry season. The rows on all beds except the first are 20 inches wide and all rows extend East and West. A drainage canal extending East and West is at the South End of the field and a canal extending North and South is on the West side of the field.

MINOR ELEMENT STUDY

To study the possible effects of minor elements on Sansevieria a factorial design was used containing presence and absence of manganese, copper, zinc and boron. The treatments were randomized in three blocks, using single row plots 2 1/2 feet wide and 60 feet long. Each block contained 16 plots with one border row on each side making a total of 18 rows. Plants were spaced 12 inches apart in the row. This test is planted on the West end of block I.

Planting stock consisted of whole plants averaging 3 feet in height obtained from a patch of wild Sansevieria in South Boynton, Florida growing entirely in the shade. All of the fiberous roots including at least three inches of rhizome stock were left attached to each plant. Plants were planted about three inches deep.

The rate of application in pounds per acre, the amount of each chemical applied per plot and the source of materials is given in the attached sheets. The chemicals were mixed with sand and applied directly underneath the plants when they were set out. Fertilizer was applied at the rate of 600# per acre, in three applications, the first application being made on April 22, 1943. Standard 4-7-5 was used. A second application was made on August 22, 1943 and the third on November 22, 1943.

Because of the extremely dry weather at the time of planting, most of the plants wilted badly and fell down though only a few plants died. The upper surface of the leaves were badly burned by the sun and turned brown, though the underside of the leaf remained green. The dry weather continued until the last week in June and germination of new plants was very slow. After the rainy season began many new shoots appeared and the plants grew rapidly. Plant height measurements were recorde on July 15, 1943 and the results of the analysis of this data is given in the attached analysis. While no significant differences are noted as to the effects of minor elements, it is not surprising since the plants had gone through an extremely dry period and most of the growth at this time represented stored energy in the rhizomes of the old plants. As the rainy season advanced growth was more rapid and new shoots began to come up much faster than in the early part of the rainy season. By October it was estimated that the number of plants had more than doubled on this test and by December 15, 1943 the number of plants in this test was estimated to be 10,500. This more than triples in a period of approximately six months growth, the 3240 plants required to plant the test. Thus, it can be seen that germination is a continuous process and is likely to continue until the land is completely covered with plants.

FERTILIZER RATIO STUDY

The object of this experiment is to test the effects of different levels of N,P and K with P held constant. This experiment consists of a factorial design with levels of 4,8 and 12 per cent of each element, with P constant at 8 per cent. It is the same size as the minor element study and the 9 treatments are randomized in 3 blocks, with single row plots 2 1/2 feet wide, 60 feet long and plants spaced 12 inches in the row. The north side of each block has 4 border rows and the south side 5 border rows.

The experiment is on the same large field block as the Minor Element Study, being on the East half of block L with the rows extending East and West. Fertilizer applications were made at the rate of 600# per acre; the first at the time of planting, Feb. 26, 1943, the second May 26, 1943 and the third August 26, 1943.

Unlike the Minor Element Study, all of the plants used in this test were growing in the complete sunlight. These plants did not wilt like those in the Minor Element Study and the original plants are still in good condition. The sunlight also did not burn the leaves of these plants like those in the Minor Element Study. Height measurements were made in July and the results of the analysis are given on the attached sheets.

The Minor Element Study and Fertilizer Ratio Test required 6480 plants to plant both tests or 3240 plants for each test. By December 15, 1943 these two tests were estimated to contain 21,000 plants. The Fertilizer Ratio Test was also in full bloom by Dec. 15, 1943 though no flowers had appeared in the Minor Element Test at that time or anywhere else in the 10 acre field. Whether flowering was due to different seed stocks or to Fertilizer effects is not known..

FERTILIZER RATE, RATIO, SPACING AND SHADE STUDY

This test consists of the first 4 blocks on the North side of the 10 acre field adjacent to the Minor Element and Fertilizer Ratio Tests. Blocks 2 and 4 are without shade while blocks 3 and 5 contain shade. Treatments for the standard 4-7-5 were: 500#, 1000#, 1500# and 2000# per acre with check rows containing no fertilizer. Treatments for the 12-0-14 were 500#, 1000# and 1500# per acre. Spacings were 8 inches and 16 inches on all four blocks. All treatments and spacings were randomized in each block and each treatment was replicated once in each block. A split-plot arrangement was used on the spacings, 192 feet of row being 8 inches and 192 feet being 16 inches.

Fertilizer is to be applied in 3 equal treatments. The first application of fertilizer was made on April 27, 1943 and the second application was made on November 27, 1943. The second application of fertilizer was planned for August, but excessive rains, labor shortages and weeds prevented it being made at that time.

Planting stock consisted of whole plants grown in the shade cut-back to ten inches above ground level. All plants contained at least 2 inches of rhizome stock and planting was done by machinery. This test was planted the first two weeks in March, 1943.

Pigeon peas were used to furnish shade on all shade blocks. All shade blocks for the entire 10 acre field were planted the first week in April, 1943. The shade blocks consists of 1 shade row with 4 rows of Sansevieria with a total of 5 shade rows to each shade block. Shade rows are also border rows on the North and South side of each shade block. All rows on both shade and no-shade blocks are 20 inches wide. This width was used because the planting machinery could not be adjusted for any narrower row. The original planting plans called for a 15 inch wide row. Rows of Sansevieria are used on the no-shade blocks to take the place of shade rows.

Then this test was planted it was very dry and windy. Much of the moisture in the plants evaporated because of the dry winds which blew almost constantly day and night. This resulted in considerable mortality among the plants in some spots. However, replanting was done to some extent and a good stand was finally obtained. Like the other tests, very little growth was obtained until after the rainy season began. Germination was much slower on this test and, unlike the tests containing whole plants, only one plant usually comes up for each original plant planted. Thus the total number of plants per block is not anywhere near equal to the number of plants obtained where whole plants are used. The no-shade blocks were estimated to have about 6500 plants per bed on December 15, 1943.

GENERAL PLANTINGS

Blocks 6 through 8 are planted with 8" and 16" spacings. Blocks 9 through 14 are 12" and 16" spacings while blocks 15, 16 and 17 are 12" and 18" respectively. All of these spacings are a split-plot arrangement and randomized on each bed. Blocks 18 and 19 are planted with 3" and 5" rhizomes while blocks 20 through 23 are planted with rhizomes of various lengths. The 3" and 5" rhizomes were spaced 2" apart in the drill. All the others were planted solidly in the drill without any spacing. Block 24 contains the monthly leaf cutting experiments and block 25 contains rhizomes, variety test, mulching and leaf cutting experiments.

Except for The Minor Element Study, Fertilizer Ratio Test and the rhizomes, all field planting was done by a machine especially designed and constructed by Mr. Winchester for planting Sansevieria. Two men feed the planter which plants two rows in a single operation. The planter is drawn by a small tractor. On rows 385 feet long where 8" and 16" spacings were used, it required an average of 1 1/2 hours to plant four rows. Where wider spacings were used less time was required.

Following planting of the Minor Element, Fertilizer Ratio and Fertilizer Rate, Ratio, Spacing and Shade Study; planting was done by blocks in the order listed above except the last two blocks. Planting operations were completed on the last rhizome block the 31st of March, 1943. All of the planting stock used on blocks 2 through 17 was cut back to 10 inches in height. Planting stocks were obtained from several large patches of wild Sansevieria in Boynton and Hypoluxo, Fla.

The rhizomes were planted by hand, ½ bushel baskets being used to hold the rhizomes when they were unloaded in the field. A special type of machine was used to open the furrows, 5 rows being opened in one operation. The rhizomes were covered 2 inches deep, but during the extremely dry weather much of the soil was blown off leaving a very thin layer of soil which dried out completely. As soon as the rains started considerable sand washed back in the drills covering the rhizomes sufficiently to insure germination. Like the other types of planting stock, germination was very slow and actually few plants came up before the latter part of June. There were some wet spots on certain beds where a considerable number of rhizomes germinated early, but these were rather spoty. However, after the rainy season began a fair stand of plants was obtained though the 3" and 5" rhizomes did not germinate as well as the others. By December 15, 1943 the 3" and 5" rhizome beds had approximately 5800 plants per bed while the rhizomes planted solidly had 8000 plants per bed. These figures apply to no-shade blocks. Standard 4-7-5 is used on blocks 6 through 25. This is to be applied in 3 applications at 600# per acre.

A SPECIAL CHARACTER OF RHIZOME PLANTS

An outstanding characteristic of the rhizome plants is that practically all are rosette in form. This of course, will result in a longer period of time elapsing before upright leaves are formed which can be cut for fiber. Whole plants and cut-back plants produce upright shoots, a necessary characteristic from the standpoint of quick fiber production.

LEAF CUTTINGS

A small leaf cutting experiment was planted in May, but the regular monthly experiments were begun in July. The leaves are divided into 3 parts, basal, middle and tip sections. Tip sections have given best results so far. Good results have been obtained with the August planting but very poor results have been obtained with most of the others. An average of about 30 days is required for fiberous roots to form under suitable conditions, but several months are required before shoots begin to appear above ground. No shoots have yet appeared above ground from any of the monthly plantings. However, some have appeared in the May planting. These are upright plants. Of the four general types of propagating material being used, leaf cuttings appear to be the slowest in producing new plants while whole plants are the quickest, followed by cut-back plants and rhizomes.

CULTIVATION

Before the first shoots came up, cultivation consisted of running wheel-plows through the middles as often as necessary to keep down grass and weeds. As the plants began to appear above ground, many plants came up in the middles so that wheel-plow cultivation had to be abandoned. Hand cultivation, using hoes was resorted to. This type of cultivation is to be continued until the plants are thick enough to discontinue cultivation.

Since new shoots often come up as much as 12 and 15 inches from the original plant, narrow rows are not desirable from the standpoint of cultivation, especially if cultivation is to be done by machinery. Wider rows, at least three to four feet, with plants planted thick in the drill might solve this problem.

Plants have a tendency to put up new shoots close to the original plant where the original plants are thick, and this factor might be utilized advantageously by thick spacing in the drill with wide rows. As the plants gradually spread outward, the middles could be kept free of weeds by the use of suitable machinery.

It might be stated that the worst weed problem is in the rainy season from July to November. During this period rains are so frequent that the ground seldom gets dry enough to cultivate, and when it does get dry enough it is only for a very short period. Hence, rapid cultivation is necessary. Also weeds in the tropics grow much more rapidly than they do in the temperate regions. The greatest cost to date has been weed fighting operations so that any system of planting or cultivation that tends to solve this problem will result in distinct lowering of costs of production.

SHADE

On account of the great diversity of soil and climatic conditions, no general rule can be formulated at this time for meeting cultural problems in Sansevieria. Where soil conditions are sufficiently favorable no shade appears to be needed but Sansevieria is easily injured if periods of dry weather occur and the supply of moisture for the soil is not sufficient as shown by the leaves withering and turning brown. In open retentive soils several weeks or even months of rainless weather may not impair the plants after they are well established, even though growth is stopped, because the supply of soil moisture is not suddenly or completely cut off, while in shallow or heavy soils two or three weeks of dry weather may check the plants badly and render them more susceptible to injury. Shade plants are beneficial to the extent that they help maintain moisture, protect the plants from the wind and frost help to maintain atmospheric humidity.

TESTING NEW SPECIES

In addition to determining the percentage and quality of the fiber, planting and decorticating experiments are needed with any new species of Sansevieria that can be obtained before the production possibilities can be known definitely, even with plants that appear very promising. In order to determine which of the many species of Sansevierias is best adapted to Florida conditions attention should first be given to the cultural characters of the plant. The extent to which Sansevieria may be grown in Florida will not be known until the various methods of procedure in tropical plant culture as affording a better approach to the practical problems under Florida conditions have been investigated.

The agricultural possibilities of a plant does not depend upon any particular system of culture as might be practiced in a certain locality, but might give equally as good results under a different system in another locality. In this respect as many experiments as possible should be undertaken in other localities as soon as expedient, so as to investigate thoroughly all the range of possibilities. More independent experiments would also afford a means of increasing the seed stock of the different kinds so that ample seed supplies or propagative material would be more rapidly available for those who are interested in determining the possibilities of the new plants. Many insect pests and diseases of tropical plants in Africa and elsewhere in the tropics are not present in Florida so that an increased interest in local experiments may be stimulated by this fact.

OTHER EXPERIMENTS

Lantana, Fla.

At Lantana, Fla. six miles from Flatwoods Plantation 50 plots each containing 25 square feet were laid out the last of May and treated with minor elements and different fertilizers. Magnesium iron, cobalt and nickel were included in these tests as well as the regular elements used at Flatwoods Plantation. In addition, potash and phosphate were used alone.

All of the Sansevieria growing at Lantana is wild stock and is growing on very poor sandy soil. It covers about an acre of ground. The plants were very yellow and indicated a lack of nitrogen as well as potash. Marked results have been noted in the response of the plants to the fertilizer treatments and some useful information should be obtained when these plants are harvested. More experiments were planned for Lantana, but the extreme labor shortage which developed in the summer prevented other experiments from being undertaken.

Small fertilizer experiments are also located at Boynton, Fla. on wild plots of Sansevieria. These are on different types of soil and in both sun and shade. The treatments are similar to those at Lantana and as at Lantana, marked results have been noted in the response of the plants to fertilizer treatments.

Comparative Propagation Notes.

Taken December 15, 1943

Whole Plants

1180 plants per row or 21, 240 plants per bed. This is on bed I which contains 18 rows. Each row had 360 original plants.

Cut-Back Plants

300 plants per row or 6300 per bed on all no-shade blocks. Applies to all beds except rhizomes and bed I.

Rhizomes

3" and 5" lengths

277 plants per row or 5817 per bed on no-shade blocks.

Other lengths planted solidly in drill

385 plants per row or 8085 per bed on no-shade blocks.

Leaf Cuttings

May planting

16 plants from 35 sections. No plants have come up from any of the regular monthly plantings started in July, though all leaf sections that are alive have fiberous roots except the November planting.

COPY

AGRICULTURAL EXPERIMENT STATION
SOILS DEPARTMENT
November 16, 1943

Sample No.	pH	Sample No.	pH
E1469- 1	6.65	E1469 -16	6.27
2	5.74	17	6.27
3	5.76	18	6.35
4	5.66	19	6.40
5	5.84	20	6.28
6	5.79	21	6.08
7	5.59	22	4.88
8	5.55	23	5.88
9	5.37	24	5.20
10	5.88	25	6.23
11	5.62	26	7.74
12	6.32	27	8.08
13	6.54	28	7.91
14	6.25	29	6.55
15	6.18		

Note: Sample 1 is from the Minor Element Test
Sample 2 is from the Fertilizer Ratio Test.
Each of the samples following 1 and 2 is taken from each successive block in the field up to and including sample 25. That is, sample 3 is from block 2, sample 4 is from block 3, etc. Sample 26 and 27 are from Pavilion Key and sample 28 is from Falka Union River. Sample 29 is the last block in the field. Sample 22 is from a block that did not receive any lime.

PHOTOGRAPHS USED WITH
SANSEVIERIA REPORT—1943

Field before planting.

Planting Operations

Mature Plants of Sansevieria metallica with flowers

Close-up of Sansevieria metallica in bloom

Sansevieria plants ready for transporting to the field

Cut back plants just after Planting

A large patch of Sansevieria on Voss Estate, Hypoluxo, Fla.

Sansevieria in edge of field on Voss Estate, Hypoluxo, Fla.
Much of the planting stock used on the ten acre field came

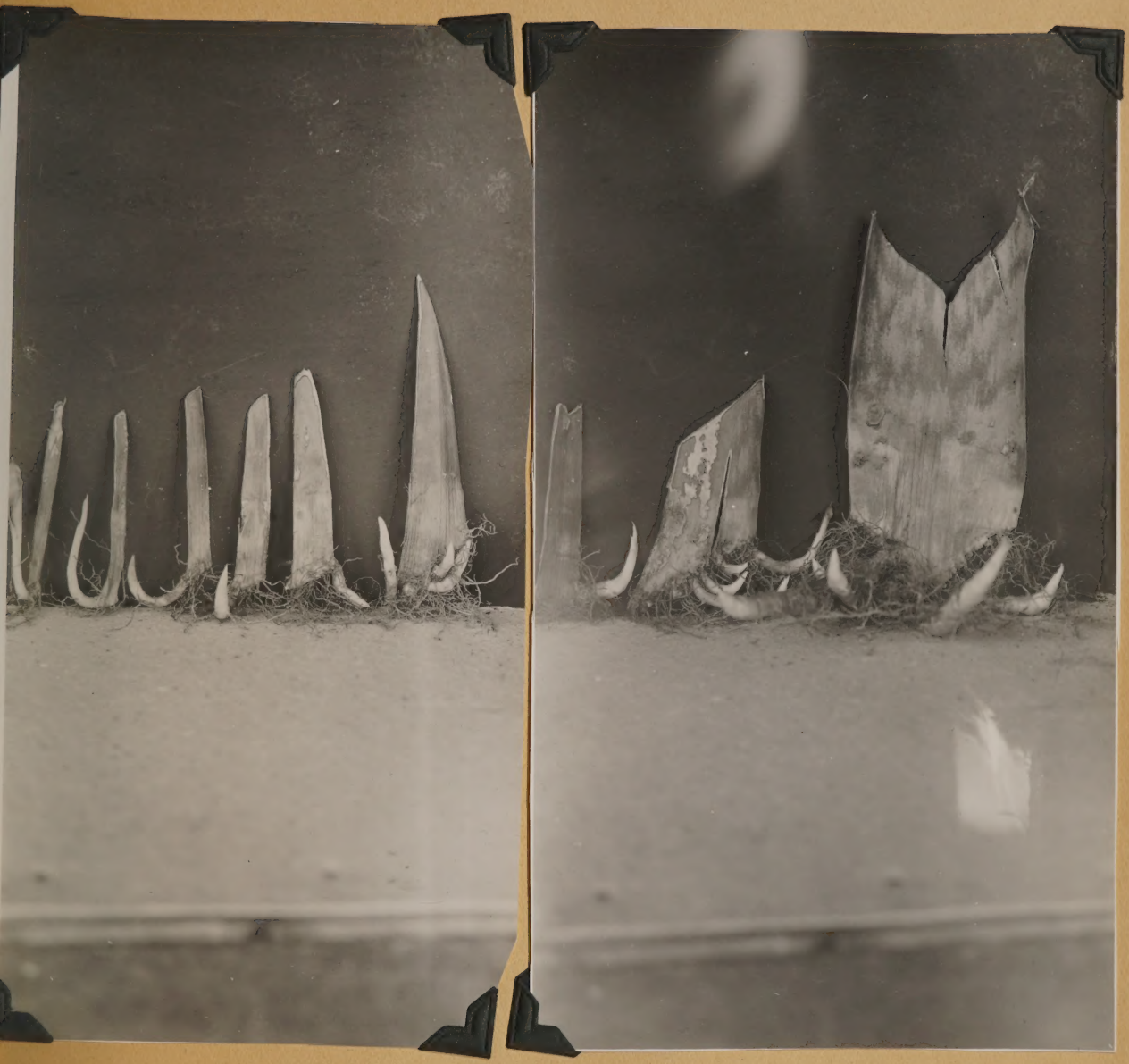
A Large pile of Sansevieria rhizomes before transporting to Field

Machine used to open rhizome furrows

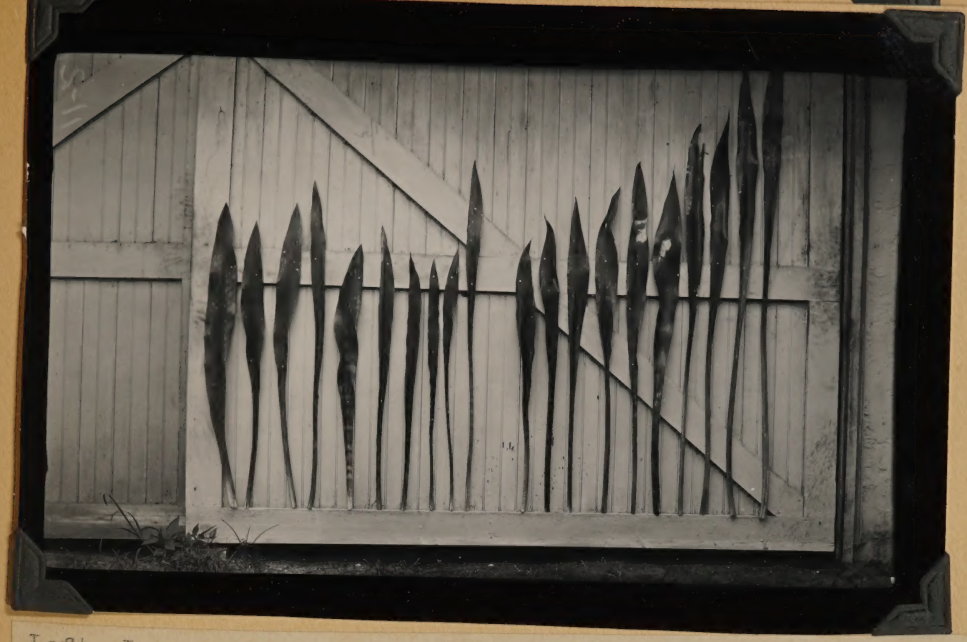
Planting rhizomes

Rhizomes in furrow

Left, Leaf cutting machine used in making leaf sections.
Right, Sansevieria on Voss Estate which furnished leaves.



Various sizes of rooted leaf cuttings



Left, Leaves 12 months old, Right, Leaves over 12 months old.

Fiber from the above leaves.

S. trifasciata growing in Arcadia, Fla.

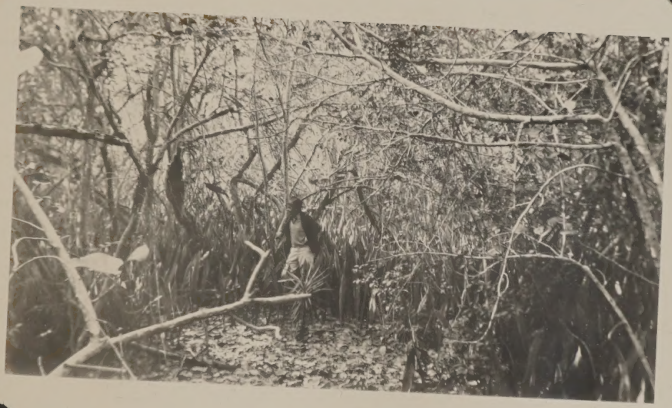
Tests conducted by the Bureau of Standards on fiber samples from this patch showed it to be stronger than any other species tested.

Sansevieria seedlings
The four plants on the left
are S. trifasciata from Arcadia, Fla.
Those on right undertermined species
from Africa.

Roselle, Hibiscus cannabinus taken in
October, 1943 one month after planting.

S. metallica, Voss Estate, Hypoluxo, Fla.

S. metallica, right and left
S. trifasciata, center



Three views of S. metallica growing wild on Pavilion Key in the Gulf of Mexico. Photographed October 1943

Boat used on Sansevieria expedition to Fla. Keys in Gulf in October 1943

Members of the Sansevieria expedition
Left to Right: S. J. Lynch, Assist. Horticulturist,
Sub-Tropical Exp. Station, Homestead, Fla.
Oscar R. Winchester, Flatwoods Plantation, Boynton, Fla.
Mills H. Byrom, Asso. Agricultural Engineer, U.S.D.A.
Dr. Roy A. Bair, Agronomist, Everglades Experiment Sta.,
Belle Glade, Fla. J. Frank Joyner, U.S.D.A, Senior Sci. Aid,
Mr. Fred P. Abbott, Assistant General Agricultural Agent,
SAL Railroad, Savannah, Ga.

Fertilizer Ratio Test just after planting.
These plants were growing wild in full sunlight
when transplanted. Transplanted Feb. 26,1943

Fertilizer Ratio Test in June, 1943

Fertilizer Ratio Test in October, 1943

Fertilizer Ratio Test in December, 1943

Minor Element Test just after Planting.
Note badly wilted plants, all of which came from a wild patch growing in the shade.

Minor Element Test in August, 1943

Minor Element Test, December 1943

Sansevieria in shade block
November 1943

Sansevieria in shade block
December 1943

Rhizome plants, December 1943

Roselle, Hibiscus cannabinus? in flower in October, 1943.